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ABSTRACT

In the Adult Multiple Intelligences (AMI) study, 10 teachers of adults from the northeastern region of the United States explored for 18 months the ways that multiple intelligences (MI) theory could support instruction and assessment in various adult learning contexts. The results of this research were published in a book by Julie Viens called MI Grows Up. Two themes identified in the book, MI reflections and MI-inspired instruction, relate specifically to math instruction for adult learners. MI reflections focuses on ways to teach about MI theory and how to use it as a tool for student self-reflection and self-understanding. By creating AMI profiles for adult learners in an adult secondary education class, the researcher had success helping the learners identify the intelligences of problems or questions and suggesting how best to approach them using their own intelligences. MI-inspired instruction encourages teachers to analyze their own instructional practice and provide students with a range of learning opportunities based on student strengths and interests. By creating open-ended assignments which took into account the multiple intelligences of groups of students, the researcher was able to teach math skills in a variety of ways that provided authentic learning experiences to adult students. (Contains 4 references.) (MO)

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Adult Multiple Intelligences and Math

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Howard Gardner, author of the theory of Multiple Intelligences, defines intelligence as "...the psycho-biological potential to create or solve a problem or fashion a product that is valued in one or more community or cultural settings" (Kallenbach & Viens, 2000, p. 13).

In December 1996, ten teachers of adults from the northeastern region of the United States, myself included, initiated work on the Adult Multiple Intelligences (AMI) Study. This research project, a collaboration between Harvard Project Zero and the New England Literacy Resource Center (NELRC)/World Education under the auspices of the National Center for the Study of Adult Learning and Literacy (NCSALL) at the Harvard Graduate School of Education, lasted 18 months. During that time, we explored the ways that Howard Gardner's Multiple Intelligences (MI) theory could support instruction and assessment in various adult learning contexts.

In the book that summarizes the findings of our study, *MI Grows Up: Multiple Intelligences in Adult Education: A Sourcebook for Practitioners*, Julie Viens, co-director of the project, explains the eight intelligences identified by Gardner (Kallenbach & Viens, 2000, pp. 15-17):

Linguistic Intelligence
- involves perceiving or generating spoken or written language
- allows communication and sense-making through language
- includes sensitivity to subtle meanings in language
- encompasses descriptive, expressive, and poetic language abilities

Logical-Mathematical Intelligence
- enables individuals to use and appreciate abstract relations
- includes facility in the use of numbers and logical thinking

Spatial Intelligence
- involves perceiving and using visual or spatial information
- [involves] transforming this information into visual images
- [includes] recreating visual images from memory

Bodily-Kinesthetic Intelligence
- allows you to use all or part of your body to "create"
- refers to the ability to control all or isolated parts of one's body
- includes athletic, creative, fine, and gross motor movement

Musical Intelligence
- involves creating, communicating, and understanding meanings made out of sound (music composition, production, and perception)
- includes ability dealing with patterns of sound

Naturalist Intelligence
- involves the ability to understand the natural world
- includes the ability to work effectively in the natural world
- allows people to distinguish among, classify, and use features of the environment
- is also applied to general classifying and patterning abilities

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Interpersonal Intelligence

- involves the capacity to recognize and make distinctions among the feelings, beliefs, and intentions of other people
- allows the use of this knowledge to work effectively in the world

Intrapersonal Intelligence

- enables individuals to understand themselves and to draw on that understanding to make decisions about viable courses of action
- includes the ability to distinguish one's feelings and to anticipate reactions to future courses of action

After attending a three-day institute and reading several recommended books (see bibliography), each AMI participant developed a research question based on her own teaching practice and interests related to MI theory. Over time, the research questions were clarified and modified as the participants' understanding of the theory evolved. The participants' various inquiries covered a range of applications, including the following questions:

- Will awareness of their own intelligence profiles help my students become more independent learners?
- Can MI-informed lessons help the progress and attendance of Learning Disabled and Attention Deficit Disorder students preparing for a GED (Tests of General Educational Development)?
- How can teacher and student, working collaboratively, a) identify the student's strongest intelligences through MI-based assessment and classroom activities? b) use the understanding of these intelligences to guide the learning process?
- What will happen when I use MI theory/instruction in teaching math?
- What kind of MI-based instruction and assessment can be developed that will help adult learners deal with math anxiety so they may reach their stated goals?

Participants in this qualitative research project collected their data in several ways. All teachers were required to keep a journal of their lessons and reflections. Other data collection strategies included interviews, analysis of student work and videotaped lessons, surveys, and dialogue journals. Two co-directors supported the teachers' research efforts through classroom visits. Over the course of the study, the participants met at quarterly institutes to discuss the progress of their research and communicated regularly both online and by phone. Upon the completion of the research project, each teacher wrote a final report detailing her findings. The co-directors analyzed all the data after it was collected and extracted common themes that emerged from the research. This information was published as a draft sourcebook that was then piloted by twelve teachers from Maryland, Texas, Ohio, and Washington.

MI Grows Up: Multiple Intelligences in Adult Education: A Sourcebook for Practitioners is a compilation of the information gathered as a result of our three-year AMI Study. The major themes addressed in the book fall under two main categories: MI Reflections and MI-Inspired Instruction. These themes and, most significantly, their connection to math instruction for adult learners will be outlined in this paper.

MI Reflections

The term "MI reflections" focuses on ways to teach about MI theory and, consequently, use it as a tool for student self-reflection and self-understanding. The teacher/researchers who participated in the study found that they had to make a conscious decision whether or not to explicitly discuss MI theory with their adult students. Those who chose to teach about the theory used a variety of ways to introduce it to their students, including presentations, handouts, activities, dialogue journals, and discussions. A number of factors influenced how much time teachers spent dealing with this topic, including student expectations, interests, and cultural considerations. In their cross study of the research findings of the ten participants in the AMI Study, co-directors Julie Viens and Silja Kallenbach found that there were three important reasons why teachers might want to spend time introducing MI theory to their students (Kallenbach & Viens, 2000, p. 27):

- "Learning about MI" to provide a rationale and explain "new," unfamiliar, nontraditional, MI-informed activities;
- "Learning about ourselves" to build student awareness of their own strengths, and to develop self-efficacy; and/or
- "Learning about our ways of learning" to help students find learning strategies that fit their strengths/interests.

Because I taught a higher functioning ASE class of students who were pursuing a GED or adult high school diploma, I found it useful to introduce the theory to my students by having them complete an informal survey that generated a discussion about the students' areas of strength (Kallenbach & Viens, 2000, pp. 74-80). The benefits of such an experience are best highlighted by the following description of how one of my students used this self-knowledge when trying to learn a new math skill.

One result of having the students acknowledge and appreciate their own intelligences was a marked change in their willingness to approach the learning process from a different perspective. This story of one student's work on math word problems provides a good example to illustrate this point. Often, when this student had to face a word problem, he would develop what I refer to as "math paralysis"; he would sit there staring at the problem, not knowing where to begin.

One evening, soon after we had created our AMI Profiles, we began working on problems that involved finding the area of a right triangle. The class had previously only worked on the calculating area of a rectangle. Without any additional instruction, I posed this problem in written form:

Consider rectangle ABCD. If side AB = 12 inches and side BC = 9 inches, what is the area of triangle ABC?

The student was stumped. I asked him what intelligences were evident in the problem. He noted linguistic and logical-mathematical. I then had him look at his AMI profile and asked him to recall his strongest areas. My notes from that evening indicate that I could actually see the student relax; his shoulders became less tense and he let out a sigh of relief when he realized that he should draw the figure before trying to compute the answer. Within a short period of time, he had the problem solved. From that point on, the student was willing to work with manipulatives and use drawing when solving math problems.

This was something I had been encouraging all my students to do for many months prior to this, with no results. It was almost as if they had not seen this as "real math" because this was not the way they had previously been taught to solve math problems in school. Their AMI Profiles became a touchstone, giving them permission to try new ways of learning, to experiment, to take risks.

MI-Inspired Instruction: The AMI Experience

The teacher/researchers in the AMI Study found MI theory to be helpful because it encourages teachers to analyze their instructional practice and, as a consequence, provide students with a range of learning opportunities based on student strengths and interests. In many cases, those involved in the study found that MI theory validated instructional practices they had already found successful when working with adults, including multi-modal, real-world based lessons and assignments. It is important to remember that MI theory, just like any other theory of education, is meant to inform, not prescribe. Each teacher/researcher involved in the AMI Study applied the theory as she thought best, based on teaching context and student population. The following information, taken from *MI Grows Up: Multiple Intelligences in Adult Education*, explains some of the key findings that emerged from the cross study of the AMI experience.

Using MI theory leads teachers to offer a greater variety of learning activities (Kallenbach & Viens, 2000, pp. 83-85).

The teacher/researchers' understanding of the plurality of intelligences led them to offer a greater variety of entry points or ways to engage the learner in his/her study of any given topic or skill. Teachers found themselves providing their students choices in how they went about learning the subject matter and a variety of

ways by which the students might demonstrate their understanding of the work. An especially popular activity, known as "Choose 3," was developed by one of the AMI teacher/researchers, Martha Jean. It allowed students to select from a comprehensive list of activities designed with the eight intelligences in mind. One example of this format, "'Choose 3'—Angles," appears below (Kallenbach & Viens, 2000, pp. 167-168).

"Choose 3"—Angles

Materials: Paper, pencil, pens, rulers, protractors, paint, Play-Doh™

1. In 2-5 minutes list as many angles as you find—acute, right, obtuse and straight—inside the class or outside.
   a. Make a graph showing each type you found.
   b. Which angle is most common? Why?
2. Using your arm and elbow form five angles.
   a. Draw those angles and write approximate measures for each.
   b. Are there any kinds of angles that cannot be made with an elbow? Explain your answer.
3. Discuss with someone and write responses to these questions:
   a. What does someone mean when someone says, "What's your angle?"
   b. If you were on an icy road and did a "360," what happened to you?
   c. Why do you think this shape, ⌊ , is called a right angle?
4. Using Play-Doh™ and/or paper, show the angles 180°, 135°, 90° and 45°.
5. Find or make five triangles. Measure each angle and find the total number of degrees in each triangle by adding up the sum of the three angles.
6. Draw, make with Play-Doh™ or paint a place you know. Mark and measure the angles in your design.
7. Write a poem, song, chant, or rap using some of the following words about angles:
   - figure formed by two lines, intersection, elbow, notch, cusp, fork, flare, obtuse, acute.
   - point of view, perspective, viewpoint, outlook, slant, standpoint, position.
   - purpose, intention, plan, aim, objective, approach, method .

Increasingly, all AMI teachers found themselves using more open-ended assignments as part of their teaching repertoire. For instance, when studying perimeter, instead of merely asking the students to calculate the distance around the sides of a 4-inch by 8-inch rectangle, I would ask them how many different figures they could draw that had a 24-inch perimeter. One of my students, who especially enjoyed challenging problems like this, termed working on these assignments "intense."

The most engaging MI-based lessons use content and approaches that are meaningful to students (Kallenbach & Viens, 2000, pp. 85-86).

The AMI teacher/researchers found that an understanding of MI theory helped them develop lessons and interdisciplinary units that provided authentic learning experiences for their adult students. As a result, these authentic learning experiences were more meaningful to the students. In my classroom, we worked on team building activities that allowed the students to display their strengths through project work. Students were given open-ended assignments, including the following two exercises: *What can we do as a group to make our center a more comfortable place in which to work and learn? How can we, as a group, encourage more adults to attend classes at our center?* My students expressed interest in working on these real-life challenges, often saying that this was their favorite part of our program. One student made the following comment to me during an interview session:

> The project is very important to me because I'm learning more with every step we take. It's exciting to find out what's next and begin the project. The most exciting part is the finished project because we all worked together to complete it.

As the students worked on these projects, I had time to observe them in authentic settings as they solved problems and created products. Once the project was underway, I found ways to tie in various math skills, such as computing percentages, calculating area, and graphing, to the project. The students got to experience math in the real world while completing real projects that were meaningful to them.

Other Key Findings

In addition to the information detailed above, several other findings emerged from the AMI Study (Kallenbach & Viens, eds. 2000: 86-91):

- MI-based approaches advance learning goals.
- Implementing MI-informed practices involves teachers taking risks.
- Persistence pays off with MI-based instruction.
- MI-informed learning activities increase student initiative and control over the content or direction of the activities.
- Building trust and community in the classroom supports MI-based instruction.

Adult students often express a need to know why they are being asked to complete a certain assignment, especially if it does not resemble what the students might consider traditional class work. I found it very beneficial to explain frequently to my students the reasons behind the various lessons and activities I presented to them. I also included them in decision-making processes as frequently as possible. While I was sifting through my data and sketching out the themes that I saw emerging in relation to my own research question, I began to realize more and more how my students had become "co-researchers" with me on this project. For my December 1997 interview, I decided to ask them what they thought I should tell other teachers about our classes and what advice they would want to give teachers to help them plan effective lessons for adult learners. Their responses support the significance of emphasizing all the intelligences and, in particular, the personal intelligences when planning an effective ABE program.

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